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(54) Lawn mower support structure.

(57) This invention relates to a lawn mower comprising a motor, preferably of the combustion engine type, rotating a knife about a vertical axis, a chassis surrounding said knife and a support structure between the motor and the chassis comprising vibration insulating means. The vibration insulating means comprise several elongated blocks (22) of elastic material the block being placed with their longitudinal axis in the radial direction so that they when being acted on by tangential forces (B) are deformed more than when they are acted on by radial forces (C) the support structure joining the chassis (16) and a motor support (10) to each other by separate means (28,29) allowing a limited tangential movement between the motor support and the chassis and preventing separation of the motor support and the chassis.

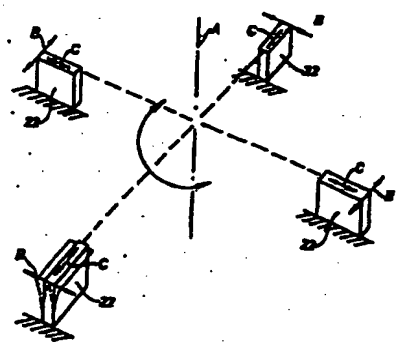

Fig. 2

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Description

Lawn mower support structure

This invention relates to a lawn mower comprising a motor, preferably of the combustion engine type, rotating a knife about a vertical axis, a chassis surrounding said knife and a support structure between the motor and the chassis comprising vibration insulating means.

In order to limit the transfer of vibrations from the cutting attachment to the operator it is previously known to fasten elastic details between the handle and the chassis and between the chassis and the motor.

The firstmentioned type of system has certain drawbacks of which the following could be mentioned. The handle usually has a very small mass compared to the total mass in the swinging system which means that the major part of the vibrations after all are transferred to the operator. The handle feels flabby because of the soft fastening and the complete chassis vibrates together with the motor which means noice and strength problem with the chassis.

Also the other system has certain drawbacks. Thus, there is a risk that the knife touches the chassis when being overloaded i.e. when the elastic elements are stretched outside their ordinary working range or when the elements break. The radial distance between the ends of the knife and the chassis has to be made comparatively large in order to safeguard free movement which means difficulties for the operator to judge the cutting width and deteriorates the fan action of the knife which negatively effects the cutting result. Moreover the elements are subject to an overload during the starting phase by the pull in the rope and by the strokes arising in the motor during the acceleration phase.

German OS 2.809.654 describes a lawn mower where the motor rests on rubber layers of different shapes which are placed on the top of the chassis. The motor is however fastened to the chassis by bolts and the purpose is to prevent structural swinging motions, or sound waves, to be transferred from one detail to the other. These layers do not work as insulating means for stiff body swinging motions, which is the purpose of our invention. Stiff body swinging motion, i.e. the swinging motion of the different parts (motor and chassis) with respect to each other has quite another amplitude and presupposes that the parts can move with respect to each other.

Swiss patent 229.959 shows a support structure for fastening an electric motor to a foundation. This structure does however not relate to a lawn mower and there are no measures taken for saeguarding that the parts are not separated if the elastic elements should break during operation. Moreover the elastic elements are rather complicated and hence expensive compared to the elements suggested in this application.

By means of a device according to the present invention all the above described problems have been solved and the arrangements also means reduced need for service and reduced costs for such service at the same time as the production costs are decreased.

This has been obtained by a device which is designed according to the the characteristic part mentioned in the claims.

An embodiment of the invention will now be described with reference to the accompanying drawings. Fig.1 is a partly broken top view of a motor support and the deck below without the vibration insulating means, fig.2 is a perspective view showing the basic structure of the insulating means, fig.3 is a vertical section through one of the insulating elements, fig.4 is a vertical section through a joint between the deck and the motor support, fig.5 shows in vertical section the insulating element during normal operation whereas fig.6 in the same section shows the insulating element when being overloaded.

In the left hand half of fig.1 a motor support 10 comprising a mainly annular metal plate is shown. The inner part 11 of the motor support 10 is somewhat higher compared to its outermost part 12. The inner part 11 has several holes 13 by means of which a motor, not shown, can be fastened on the support by screw joints. The outer part 12 has several rectangular holes 14 in order to take up the insulating elements in a way which will be described below. The same part also has several oval holes 15 intended to take up a fastening means for the motor support 10.

The right hand side of fig.1 shows an annular deck 16 situated below the motor support. The deck can be a part of the casing forming the chassis or in a suitable way be fastened to it. The deck 16 has several pockets 17 having a rectangular bottom 18 limited by a surrounding upwards extending bead 19. Further the deck 16 on its top surface has several cylindrical dowels 20 having a central threaded hole 21.

Between the motor support 10 and the deck 16 several insulating elements are attached. These elements comprise elongated rubber blocks 22 which are placed so that their longitudinal axis is directed radially with respect to the rotation shaft A of the motor. This appears from fig.2. By the positioning and shape of the blocks a low spring constant is achieved in the rotation direction i.e. in the direction indicated by the arrows B whereas the spring constant in radial direction i.e. in the direction of C is considerably greater. This means a better vibration insulating than if the elements would have the same spring constant in all directions which in turn means that the distance between the ends of the knife and casing can be minimized.

The blocks 22 can for instance be provided with a head 23 as shown in fig.3 whereby each block by means of a bracket 24 is fastened to the motor support 10. The bracket which preferably is of plastics or metal forms a U-shaped clamp with an

expanding bottom part 25 in which the head 23 of the block can be inserted and kept. On the outside of the two legs 26 of the clamp 24 there is a longitudinal groove 27. By putting the clamp 24 with the block 22 in the hole 14 of the motor support 10 whereby the grooves 27 by compression of the block can be forced to engage the edges of the hole the block 22 is secured to the motor support 10. Thus, the motor support is placed on the deck 16 and the rubber blocks 22 are allowed to fall into the pockets 17.

In order to join the motor support and the deck to each other a fastening device illustrated in fig.4 is used. The fastening device comprises a screw 28 taking up a sleeve 29 with an upper and a lower flange 30 and 31 respectively. The sleeve 29 is in turn surrounded by a rubber sleeve 32 which is also provided with an upper flange 33. By inserting the screw 28 with the attached sleeves 29 and 32, respectively, through the hole 15 of the motor support 10 and fasten the screw to the threaded hole 21 on the deck 16 the motor support is locked to the deck with a minor axial play. It should be observed that the size of the hole 15 compared to the outer diameter of the sleeve 32 is such that a certain tangential movement of the motor support is allowed. It is of course possible within the frame of the invention to invert the fastening arrangement i.e. to place the holes in the deck and the screw with the sleeves on the motor support.

In fig. 5 and 6 the deformation of the rubber blocks during normal load and overload is shown. From the figures appears how the blocks 22 by means of their clamps 24 are guided to work with a shorter lever when being overloaded. This means that the blocks can be made very soft without the movement when overloaded being unacceptably great. Since the blocks are not vulcanized to the clamps which is common in similar arrangements a far cheaper system is achieved which at the same time is more reliable. The fastening arrangement shown in the figure means that the axial forces, i.e. vertical forces, are completely taken up by the screws 28 at the same time as a certain movement is allowed in tangential direction.

By this arrangement the knife never can reach the chassis even if all blocks should be destroyed.

Claims

1. Lawn mower comprising a motor, preferably of the combustion engine type, rotating a knife about a vertical axis, a chassis surrounding said knife and a support structure between the motor and the chassis comprising vibration insulating means **characterized** in that the vibration insulating means comprise several elongated block (22) of elastic material the blocks being placed with their longitudinal axis in the radial direction so that they when being acted on by tangential forces (B) are deformed more than when they are acted on by radial forces (C) the support structure joining the chassis (16) and a motor support (10) to each other by separate means (28,29) allowing a limited tangential movement between the motor support and the chassis and preventing separation of the motor support and the chassis.

2. Lawn mower according to claim 1, **characterized** in that the separate means comprise sleeve (29) which are provided with flanges (30) and which are fixed to the chassis (16), the sleeves freely extending through holes (15) in the motor support (10) so that the flanges (30) of the sleeves lock the motor support (10) to the chassis.

3. Lawn mower according to claim 2, **characterized** in that the sleeve (29) and/or the flange (30) have a rubber cover (32,33) facing the engine support (10).

4. Lawn mower according to claim 2 or 3, **characterized** in that the sleeve (29) instead is fastened to the motor support (10) and the hole is in the chassis (16).

5. Lawn mower according to any of the preceeding claims, **characterized** in that the elongated elastic blocks (22) are fixed to the motor support (10) or to the chassis (16) by releasable clamps (24).

6. Lawn mower according to claim 5, **characterized** in that the clamps (24) in section are U-shaped and at the outer part of the legs are provided with grooves (27) to engage the edges of elongated holes (14) in the chassis or motor support.

7. Lawn mower according to any of the preceeding claims, **characterized** in that the elongated elastic bodies (22) rest in pockets (17) on the chassis or on the motor support.

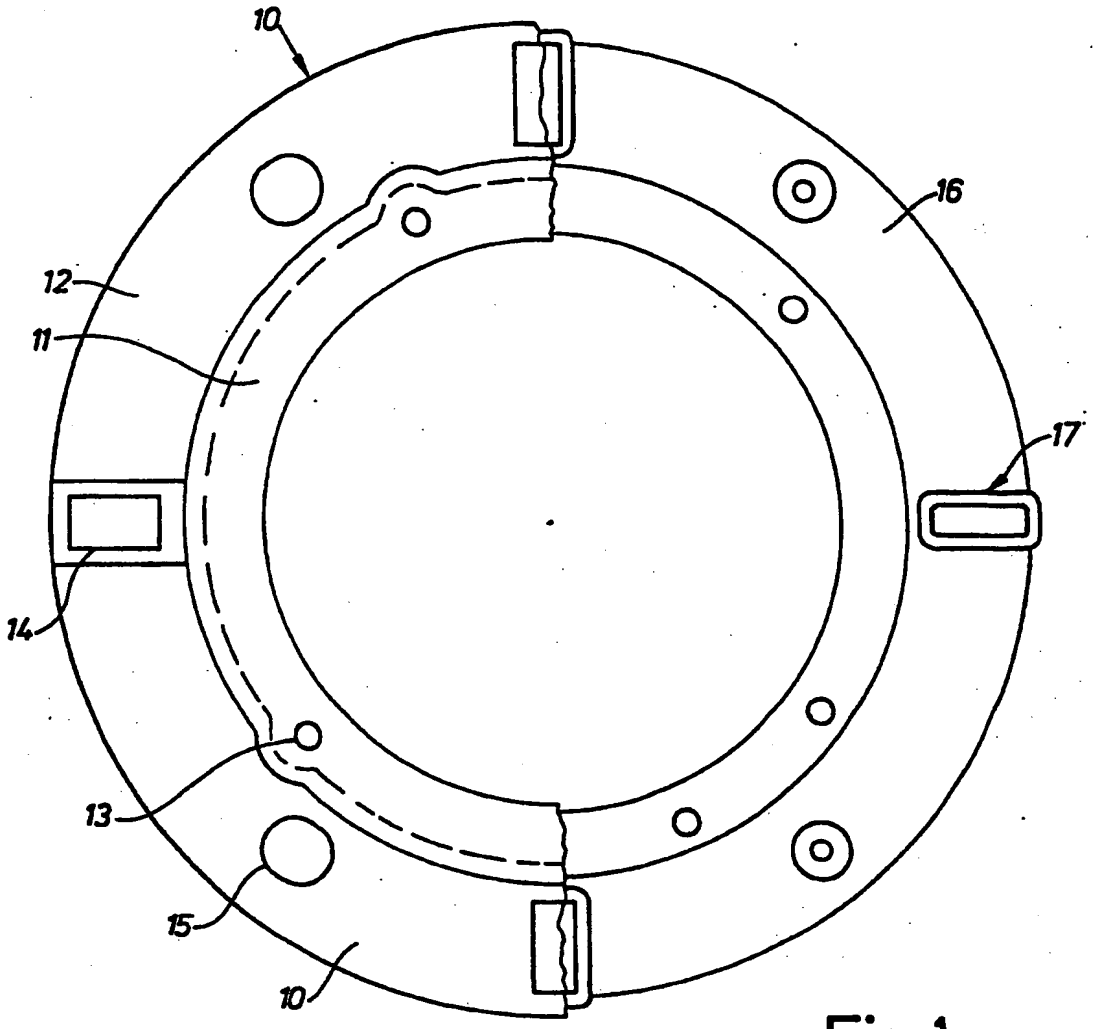

Fig. 1

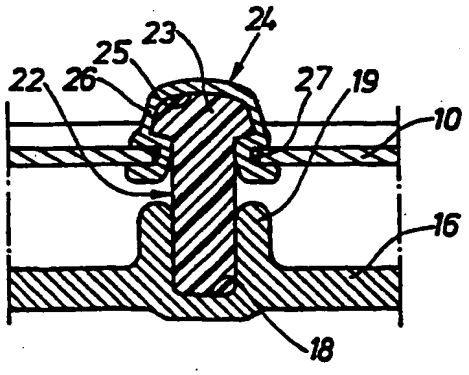

Fig. 3

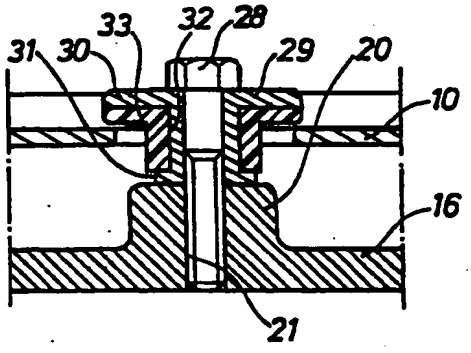

Fig. 4

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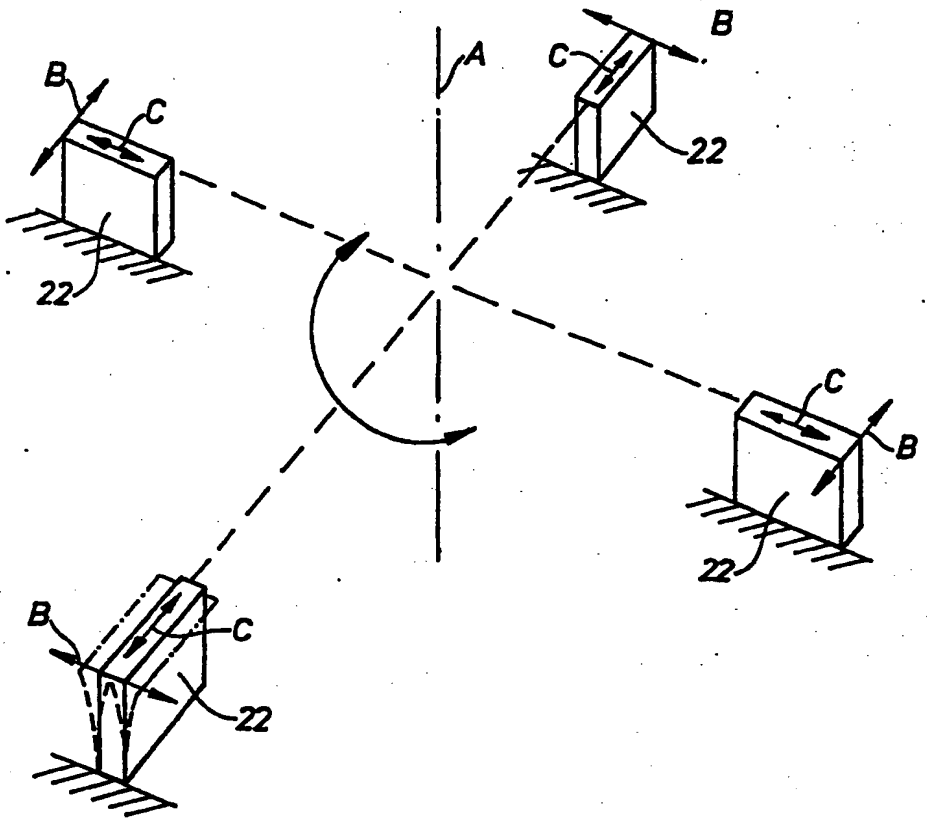

Fig. 2

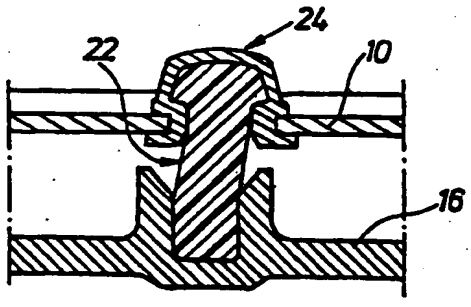

Fig. 5

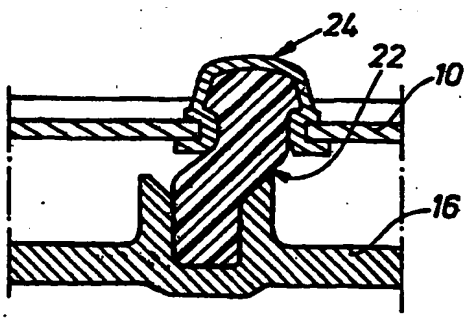

Fig. 6

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 87850335.8

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
D,A	DE - A - 2 809 654 (GUTBROD WERKE) * Fig. 1-3; page 6, last paragraph * --	1,3	A 01 D 34/82 A 01 D 34/68 A 01 D 67/00
A	US - A - 3 056 249 (G.J. SHAW) * Fig. 1,7,8,9 * --	1	
A	DE - A1 - 2 337 721 (AS-MOTOR GMBH) * Fig. 1,3; claim 23 * --	2,3,5	
A	US - A - 3 613 338 (C.C. FURTAW) ----		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

A 01 D 34/00
A 01 D 67/00
A 01 D 73/00
F 02 B 63/00
F 02 B 77/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	09-02-1988	HAVLIK

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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